General

Guideline Title

ACR Appropriateness Criteria® lower urinary tract symptoms: suspicion of benign prostatic hyperplasia.

Bibliographic Source(s)

Friedman B, Leyendecker JR, Blaufox MD, Eberhardt SC, Fulgham PF, Goldfarb S, Hartman MS, Hosseinzadeh K, Lazarus E, Lockhart ME, Oto A, Porter C, Sudakoff GS, Verma S, Remer EM, Expert Panel on Urologic Imaging. ACR Appropriateness CriteriaÂ® lower urinary tract symptoms: suspicion of benign prostatic hyperplasia [online publication]. Reston (VA): American College of Radiology (ACR); 2014. 5 p. [27 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Dighe M, Casalino DD, Remer EM, Arellano RS, Bishoff JT, Coursey CA, Fulgham P, Goldfarb S, Israel GM, Lazarus E, Leyendecker JR, Nikolaidis P, Papanicolaou N, Prasad S, Ramchandani P, Sheth S, Vikram R, Expert Panel on Urologic Imaging. ACR Appropriateness Criteria® obstructive voiding symptoms secondary to prostate disease. [online publication]. Reston (VA): American College of Radiology (ACR); 2010. 5 p. [31 references]

Recommendations

Major Recommendations

ACR Appropriateness Criteria®

Clinical Condition: Lower Urinary Tract Symptoms: Suspicion of Benign Prostatic Hyperplasia

Radiologic Procedure	Rating	Comments	RRL*
US pelvis (bladder and prostate) transabdominal	6	Consider this procedure after patient voids to measure residual urine. If there is significant residual urine, an evaluation of upper tracts is indicated. This procedure gives an estimate of prostate size and bladder wall thickness. It can also measure intravesical prostate protrusion.	O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate		The rating could be higher for this	*Relative Radiation

Radiologic Procedure	Rating	Comments	RRL*
		procedure if significant residual urine is present or if renal insufficiency is present to evaluate for hydronephrosis.	
MRI pelvis without contrast	3	MRI can determine prostate size, urinary bladder wall thickness, and hydronephrosis.	O
X-ray intravenous urography	2	The appropriateness rating could be higher for this procedure if significant residual urine is present. In patients with stones, hematuria, or atypical history, the study may be warranted. CT urography has replaced IVU in some centers.	
MRI pelvis without and with contrast	2		O
X-ray voiding cystourethrography	2	Consider this procedure in men younger than 50 with symptoms.	
X-ray abdomen	2	Other imaging studies are more useful.	
US pelvis (prostate) transrectal	2	Resistive indices have been shown to be elevated in BPH and to decrease after transurethral vaporization of the prostate, suggesting that resistive indices can be used to evaluate severity of BPH and monitor therapy. This procedure can assess for intravesical prostate protrusion.	O
X-ray retrograde urethrography	1	This procedure does not assess prostate size.	
CT abdomen and pelvis without and with contrast	1		
CT abdomen and pelvis without contrast	1		
CT abdomen and pelvis with contrast	1		
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the table are listed at the end of the "Major Recommendations" field.

Summary of Literature Review

Introduction/Background

Obstructive voiding symptoms secondary to prostate disease include hesitancy, decreased force of stream, terminal dribbling, postvoid fullness, and double voiding. Benign prostatic hyperplasia (BPH) is the most common cause of obstructive voiding symptoms, occurring in approximately

25% of men between the ages of 40 and 49. The incidence increases to more than 80% in men between the ages of 70 and 79. Other causes of bladder outlet obstruction include urethral stricture, prostate cancer, bladder neck contracture, bladder calculi, and neurogenic disease.

Imaging is not recommended as a first-line tool in patients suspected of having lower urinary tract symptoms secondary to probable BPH. Rather, treatments including medication are initially focused on alleviating the patient's symptoms. If there is no improvement in symptoms or if there are complicating factors such as hematuria, several imaging studies have been used in evaluating patients with symptoms of bladder outlet obstruction. These include radiographs, intravenous urography (IVU), urethrography, transabdominal and transrectal ultrasonography (TRUS), computed tomography (CT), and magnetic resonance imaging (MRI). Benefits of imaging patients with obstructive voiding symptoms secondary to prostate disease include determination of the presence and degree of hydronephrosis, estimation of renal function, evaluation of the bladder and prostate, and detection of incidental upper-tract malignancies or stones.

Radiography

Radiography cannot be used to visualize the prostate directly. A distended bladder can be visualized as a pelvic mass, but unless information is available regarding the timing of the patient's last void, this finding is of uncertain value. Prostatic calcifications can be visualized and indicate glandular enlargement if they extend above the pubic symphysis. Bladder calculi can also be identified since approximately 90% of calculi are opaque.

IVU is performed infrequently. In patients with stones, hematuria, or atypical history, the study may be warranted. CT urography has replaced IVU in most centers.

Retrograde urethrography is valuable to exclude urethral strictures but does not accurately assess the size of the prostate gland. Thus it is not part of the routine evaluation of patients with lower urinary tract symptoms. Voiding cystourethrography should be considered to evaluate for urethral strictures only in men younger than age 50 with outflow obstruction symptoms.

Ultrasound

Ultrasound (US) can be used to image the prostate transabdominally (through a distended bladder) or with TRUS. Both transabdominal US and TRUS are equally accurate for measuring prostate volume. Identifying the size of the prostate is important since it helps determine the type of therapy indicated. The US pattern is too nonspecific to differentiate benign from malignant prostate lesions. US can also be used to image opaque and nonopaque bladder calculi, which may be a cause of outlet obstruction or may be secondary to outlet obstruction and chronic retention of urine. Transabdominal ultrasound can also show dilated distal ureters and urinary bladder diverticula.

The size of the enlarged prostate can be detected accurately by TRUS and MRI. Both have an advantage in that the internal prostatic anatomy is better seen and the ratio of glandular to stromal tissue in the prostate can be determined, although this information has not proven clinically useful to date.

The use of resistive index (RI) in prostate disease has been proposed as helpful. RI measured during TRUS has been found to be elevated in the transition zone of patients with BPH but not in the peripheral or central zones and not in normal patients or those with prostate cancer. RI has also been shown to decrease after transurethral vaporization of the prostate, suggesting that it can be used to evaluate the severity of BPH and monitor the outcomes of therapy. TRUS is, however, preferred to guide lesion-directed and systematic biopsies of the prostate.

US contrast agents have been shown to make tumors more conspicuous due to their hypervascularity, thus improving the detection rate of malignancy in contrast-enhanced targeted cases compared to sextant cases. Three-dimensional (3D) US has been shown to add anatomic information from the coronal plane, which may allow better calculation of prostate volume.

Secondary changes of bladder outlet obstruction, such as bladder wall thickening, are better seen with US than with IVU. Measurement of bladder wall thickness can detect bladder outlet obstruction better than free uroflowmetry, postvoid residual urine volume, or prostate volume. In one study, detrusor wall thickness and intravesical prostatic protrusion had the best diagnostic accuracy (87%) for distinguishing bladder obstruction from BPH. US can evaluate the degree of intravesical prostatic protrusion, which may guide therapy. Measurements >1 cm suggest surgical therapy may be preferable to medical therapy.

Abdominal (suprapubic) US may be used to accurately (±15%) measure residual urine volume in 90% of patients. However, catheterization is probably the least expensive method to accurately assess residual urine in the bladder.

In patients with azotemia or a high postvoid residual rate, the collecting system of the kidneys should be imaged for evidence of hydronephrosis.

Computed Tomography and Magnetic Resonance Imaging

CT has not proven to be of much value in evaluating the benign, enlarged prostate. Multiparametric MRI has value in prostate cancer evaluation.

However, use of MRI for the benign enlarged prostate is limited. MRI can evaluate prostate size and morphology, but other less costly procedures, such as US, are preferred.

There is no evidence that patients with BPH have a higher incidence of asymptomatic renal cancers than the general population in the same age group; therefore, a contrast-enhanced examination to search for occult neoplasms is unwarranted. A prospective study of 502 patients found benign renal cysts in 10%, renal cancers in less than 1%, and significant upper urinary tract obstruction in 2.6%. When patients have obstructive symptoms and renal insufficiency, US rather than contrast-enhanced examination is recommended to evaluate for hydronephrosis. In patients with severe hydronephrosis, azotemia is almost always present, and US is indicated. In summary, although not routinely recommended, upper urinary tract imaging preferably with CT or MRI is indicated in patients with BPH and one or more of the following: hematuria (including asymptomatic microscopic hematuria), laboratory evidence of renal insufficiency, history of urinary tract infection, urolithiasis, previous urinary tract surgery, or congenital or acquired renal disease.

Summary

- For patients who have normal renal function but suffer lower urinary tract symptoms, imaging workup should be minimal.
- US is occasionally desirable for estimating prostate size, intravesical prostate protrusion, bladder volume, and detrusor thickness prior to surgery.
- If azotemia is present, the upper urinary tracts should definitely be evaluated with US for the presence of hydronephrosis.

Abbreviations

- BPH, benign prostatic hyperplasia
- CT, computed tomography
- IVU, intravenous urography
- MRI, magnetic resonance imaging
- US, ultrasound

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
	<0.1 mSv	<0.03 mSv
	0.1-1 mSv	0.03-0.3 mSv
	1-10 mSv	0.3-3 mSv
	10-30 mSv	3-10 mSv
	30-100 mSv	10-30 mSv
*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies."		

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

- Lower urinary tract symptoms
- Benign prostatic hyperplasia (BPH)

Guideline Category

Diagnosis

Evaluation

Clinical Specialty

Family Practice

Geriatrics

Internal Medicine

Nephrology

Radiology

Urology

Intended Users

Health Plans

Hospitals

Managed Care Organizations

Physicians

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of radiologic examinations in investigating lower urinary tract symptoms and suspected benign prostatic hyperplasia (BPH)

Target Population

Male patients with lower urinary tract symptoms and suspicion of benign prostatic hyperplasia (BPH)

Interventions and Practices Considered

1. Ultrasound (US)
    - Pelvis (bladder and prostate) transabdominal
    - Kidney retroperitoneal
    - Pelvis (prostate) transrectal
2. X-ray
    - Intravenous urography (IVU)
    - Voiding cystourethrography
    - Abdomen
    - Retrograde urethrography
3. Magnetic resonance imaging (MRI) pelvis

- Without contrast
- Without and with contrast

4. Computed tomography (CT) abdomen and pelvis
    - Without and with contrast
    - Without contrast
    - With contrast

Major Outcomes Considered

- Utility of radiologic procedures in the evaluation of lower urinary tract symptoms and suspicion of benign prostatic hyperplasia
- Diagnostic accuracy, sensitivity, specificity, and positive predictive value of radiologic procedures

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Procedure

Staff search in PubMed only for peer reviewed medical literature for routine searches. Any article or guideline may be used by the author in the narrative but those materials may have been identified outside of the routine literature search process.

The Medline literature search is based on keywords provided by the topic author. The two general classes of keywords are those related to the condition (e.g., ankle pain, fever) and those that describe the diagnostic or therapeutic intervention of interest (e.g., mammography, MRI).

The search terms and parameters are manipulated to produce the most relevant, current evidence to address the American College of Radiology Appropriateness Criteria (ACR AC) topic being reviewed or developed. Combining the clinical conditions and diagnostic modalities or therapeutic procedures narrows the search to be relevant to the topic. Exploding the term "diagnostic imaging" captures relevant results for diagnostic topics.

The following criteria/limits are used in the searches.

1. Articles that have abstracts available and are concerned with humans.
2. Restrict the search to the year prior to the last topic update or in some cases the author of the topic may specify which year range to use in the search. For new topics, the year range is restricted to the last 10 years unless the topic author provides other instructions.
3. May restrict the search to Adults only or Pediatrics only.
4. Articles consisting of only summaries or case reports are often excluded from final results.

The search strategy may be revised to improve the output as needed.

Number of Source Documents

The total number of source documents identified as the result of the literature search is not known.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Study Quality Category Definitions

Category 1 - The study is well-designed and accounts for common biases.

Category 2 - The study is moderately well-designed and accounts for most common biases.

Category 3 - There are important study design limitations.

Category 4 - The study is not useful as primary evidence. The article may not be a clinical study or the study design is invalid, or conclusions are based on expert consensus. For example:

a. The study does not meet the criteria for or is not a hypothesis-based clinical study (e.g., a book chapter or case report or case series description).
b. The study may synthesize and draw conclusions about several studies such as a literature review article or book chapter but is not primary evidence.
c. The study is an expert opinion or consensus document.

Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author drafts or revises the narrative text summarizing the evidence found in the literature. American College of Radiology (ACR) staff draft an evidence table based on the analysis of the selected literature. These tables rate the strength of the evidence (study quality) for each article included in the narrative text.

The expert panel reviews the narrative text, evidence table, and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the table. Each individual panel member assigns a rating based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Rating Appropriateness

The appropriateness ratings for each of the procedures included in the Appropriateness Criteria topics are determined using a modified Delphi methodology. A series of surveys are conducted to elicit each panelist's expert interpretation of the evidence, based on the available data, regarding the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario. American College of Radiology (ACR) staff distribute surveys to the panelists along with the evidence table and narrative. Each panelist interprets the available evidence and rates each procedure. The surveys are completed by panelists without consulting other panelists. The appropriateness rating scale is an ordinal scale that uses integers from 1 to 9 grouped into three categories: 1, 2, or 3 are in the category "usually not appropriate"; 4, 5, or 6 are in the category "may be appropriate"; and 7, 8, or 9 are in the category "usually appropriate." Each panel member assigns one rating for each procedure for a clinical scenario. The ratings assigned by each panel member are presented in a table displaying the frequency distribution of the ratings without identifying which members provided any particular rating.

If consensus is reached, the median rating is assigned as the panel's final recommendation/rating. Consensus is defined as eighty percent (80%) agreement within a rating category. A maximum of three rounds may be conducted to reach consensus. Consensus among the panel members must be achieved to determine the final rating for each procedure.

If consensus is not reached, the panel is convened by conference call. The strengths and weaknesses of each imaging procedure that has not reached consensus are discussed and a final rating is proposed. If the panelists on the call agree, the rating is proposed as the panel's consensus. The document is circulated to all the panelists to make the final determination. If consensus cannot be reached on the call or when the document is circulated, "No consensus" appears in the rating column and the reasons for this decision are added to the comment sections.

This modified Delphi method enables each panelist to express individual interpretations of the evidence and his or her expert opinion without excessive influence from fellow panelists in a simple, standardized and economical process. A more detailed explanation of the complete process can be found in additional methodology documents found on the ACR Web site (see also the "Availability of Companion Documents" field).

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current literature and expert panel consensus.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Selection of appropriate radiologic imaging procedures to investigate lower urinary tract symptoms and suspected benign prostatic hyperplasia (BPH)

Potential Harms

Relative Radiation Level

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure).

For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the American College of Radiology (ACR) Appropriateness Criteria® Radiation Dose Assessment Introduction document (see the "Availability of Companion Documents" field).

Qualifying Statements

Qualifying Statements

The American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Living with Illness

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

Friedman B, Leyendecker JR, Blaufox MD, Eberhardt SC, Fulgham PF, Goldfarb S, Hartman MS, Hosseinzadeh K, Lazarus E, Lockhart ME, Oto A, Porter C, Sudakoff GS, Verma S, Remer EM, Expert Panel on Urologic Imaging. ACR Appropriateness CriteriaÂ® lower urinary tract symptoms: suspicion of benign prostatic hyperplasia [online publication]. Reston (VA): American College of Radiology (ACR); 2014. 5 p. [27 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

1995 (revised 2014)

Guideline Developer(s)

American College of Radiology - Medical Specialty Society

Source(s) of Funding

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Urologic Imaging

Composition of Group That Authored the Guideline

Panel Members: Barak Friedman, MD (*Principal Author*); John R. Leyendecker, MD (*Panel Vice-chair*); M. Donald Blaufox, MD, PhD; Steven C. Eberhardt, MD; Pat F. Fulgham, MD; Stanley Goldfarb, MD; Matthew S. Hartman, MD; Keyanoosh Hosseinzadeh, MD; Elizabeth Lazarus, MD; Mark E. Lockhart, MD, MPH; Aytekin Oto, MD; Christopher Porter, MD; Gary S. Sudakoff, MD; Sadhna Verma, MD; Erick M. Remer, MD (*Panel Chair*)

Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Dighe M, Casalino DD, Remer EM, Arellano RS, Bishoff JT, Coursey CA, Fulgham P, Goldfarb S, Israel GM, Lazarus E, Leyendecker JR, Nikolaidis P, Papanicolaou N, Prasad S, Ramchandani P, Sheth S, Vikram R, Expert Panel on Urologic Imaging. ACR Appropriateness Criteria® obstructive voiding symptoms secondary to prostate disease. [online publication]. Reston (VA): American College of Radiology (ACR); 2010. 5 p. [31 references]

Guideline Availability

Electronic copies: Available from the American College of Radiology (ACR) Web site .

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

Availability of Companion Documents

The following are available:

- ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available from the American College of Radiology (ACR) Web site .
- ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 2013 Apr. 1 p. Electronic copies: Available from the ACR Web site .
- ACR Appropriateness Criteria®. Evidence table development – diagnostic studies. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available from the ACR Web site .
- ACR Appropriateness Criteria®. Radiation dose assessment introduction. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available from the ACR Web site .
- ACR Appropriateness Criteria®. Procedure information. Reston (VA): American College of Radiology; 2013 Apr. 1 p. Electronic copies: Available from the ACR Web site .
- ACR Appropriateness Criteria® lower urinary tract symptoms: suspicion of benign prostatic hyperplasia. Evidence table. Reston (VA): American College of Radiology; 2014. 8 p. Electronic copies: Available from the ACR Web site .

Patient Resources

None available

NGC Status

This summary was completed by ECRI on May 6, 2001. The information was verified by the guideline developer as of June 29, 2001. This summary was updated by ECRI on September 8, 2004. The updated information was verified by the guideline developer on October 8, 2004. This summary was updated by ECRI on February 7, 2006, November 21, 2007, and June 4, 2010. This summary was updated by ECRI Institute on January 13, 2011 following the U.S. Food and Drug Administration (FDA) advisory on gadolinium-based contrast agents. This NGC summary was updated by ECRI Institute on August 30, 2011 and August 14, 2014.

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